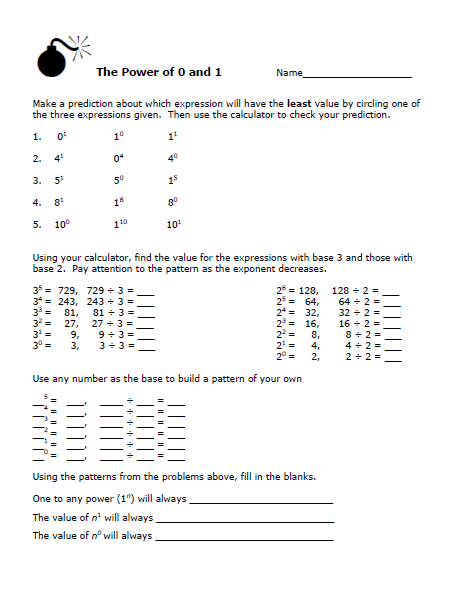
**Course: Math 8 CCSS Standard Number(s): 8.EE.1 Day: 2**

**Unit # and Title: Unit One-Expressions & the Number System Block(s)/Period(s): 1 2 3 4 5 6**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Essential Question(s):** | **When would you use the properties of integer exponents?**  **Why would you find rational approximations of irrational numbers?**  **In what ways can rational numbers be useful?** | | |
| **Learning Target(s)**  **“I can statements”** | **I can recognize and apply the properties of integer exponents (positive and negative)**  **I can generate equivalent numerical expressions using the properties of integer exponents.** | | |
| **Essential Vocabulary** | **Power, Base, Exponent, Exponential Form, Standard Form, Expanded Form** | | |
| **Resources and Materials** | **Teacher** | | **Student** |
| |  | | --- | | [CT Laws of Powers](http://www.austinschools.org/curriculum/math/hs/algI/documents/M_Alg1_5th_6wks_U1_L1_1011.pdf) | | [Discovery of patterns with Positive and Negative Exponents](http://www.austinschools.org/curriculum/math/hs/algI/documents/M_Alg1_5th_6wks_U1_L2_1011.pdf) | | [PowerPoint](http://granicher.wikispaces.com/Exponents+and+Powers) | | | **Notes** [**http://betterlesson.com/document/209364/unit-3-lesson-1-writing-exponents-and-evaluating-expressions-with-integral-and-zero-exponents-docx**](http://betterlesson.com/document/209364/unit-3-lesson-1-writing-exponents-and-evaluating-expressions-with-integral-and-zero-exponents-docx)  **Calculator** |
| **8 Mathematical Practices:** | | | |
| * 1. Make sense of problems and persevere in solving them. * 2. Reason abstractly and quantitatively. * 3. Construct viable arguments and critique the reasoning of others. * 4. Model with mathematics. | | * 5. Use appropriate tools strategically. * 6. Attend to precision. * 7. Look for and make use of structure. * 8. Look for and express regularity in repeated reasoning. | |
| **Activating Strategy**  **(Opening Activity)** | **Brain Duster/Warm up**  **[Page 1](http://betterlesson.com/document/209364/unit-3-lesson-1-writing-exponents-and-evaluating-expressions-with-integral-and-zero-exponents-docx)**  **Exploration** [**Page 2-3**](http://betterlesson.com/lesson/64958/lesson-1-writing-exponents-and-evaluating-expressions-with-exponents?from=search#/document/209364/unit-3-lesson-1-writing-exponents-and-evaluating-expressions-with-integral-and-zero-exponents-docx)   1. Write out the expanded form of the first exponent (105 written as 1 • 10 • 10 • 10 • 10 • 10) 2. Do the second one, and discuss what is happening from row to row ( divide by 10 – write this in the “Operation column going down and draw an additional arrow for each row) 3. Let students complete the table on their own 4. As students approach 100, have a discussion about what something to the 0 power means. 5. To find out what 10 to the -1 means, have students continue the pattern and discuss how one would write it (as a fraction!) 6. Complete the table, and then discuss how students could move back up row by row (multiply by 10!) and the effect it would have on the table. 7. Have students work in groups to answer the questions   Or  See Attached Document: Investigating the Power of 0 and 1 | | |
| **Cognitive Teaching Strategies**  **Me/We/Few/You**  **(TIP-Teacher input**  **SAP-Student actively participates**  **GP – Guided Practice**  **IP-Independent Practice)** | [PowerPoint](http://granicher.wikispaces.com/Exponents+and+Powers)  **Evaluating Negative Exponents**  TIP: Review the negative exponents rule   1. Have students first re-write the expression as a fraction with positive exponents 2. Have students simplify the numerator (if necessary) and then the denominator 3. Have students complete the you try 4. Go over the you try   **Evaluate Expressions with Zero Exponents and Using Order of Operations** [**Page 3-4**](http://betterlesson.com/lesson/64958/lesson-1-writing-exponents-and-evaluating-expressions-with-exponents?from=search#/document/209364/unit-3-lesson-1-writing-exponents-and-evaluating-expressions-with-integral-and-zero-exponents-docx)   1. Have students simplify the zero powers to one, then use PEMDAS to evaluate 2. For example 5 problems, have students substitute and be sure to SHOW their substitution with parentheses. 3. Have students complete the you try 4. Go over the you try.   [**Practice A**](http://my.hrw.com/tabnav/controller.jsp?isbn=9780547687759) | | |
| **Summarizing Strategy**  **(Closing Activity)** | Exit Slip [Page 5](http://betterlesson.com/lesson/64958/lesson-1-writing-exponents-and-evaluating-expressions-with-exponents?from=search#/document/209364/unit-3-lesson-1-writing-exponents-and-evaluating-expressions-with-integral-and-zero-exponents-docx) | | |
| **Assessment/Homework** | **Puzzles, Twisters, & Teasers (Attached)** | | |
| **Extending/Refining** | **Refining; Review for Mastery (Attached)**  **Extending: Problem Solving (Attached)** | | |

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**Exponents and Roots**

**Practice A: Integer Exponents**

**Simplify. Write in decimal form.**

1. 10−1 2. 10−6 3. 102 4. 101

5. 100 6. 103 7. 10−5 8. 106

9. 10−7 10. 104 11. 10−3 12. 105

**Simplify.**

13. (−2)−3 14. 3−4 15. (−4)−2 16. 2−4

17. 5−2 18. 6−3 19. (−9)−2 20. (−3)−3

21. 8 − 30  2−1 22. 4  (−6)0 − 4−1

23. 3(−9)0  4−2 24. 6  (−5)−2 − (4  3)0

25. One centimeter equals 10−2 meter. Simplify 10−2.

26. The area of a square is 10−4 square feet. Simplify 10−4.

**Answers for Lesson 1**

**Practice A**

1. 0.12. 0.000001

3. 100 4. 10

5. 16. 1000

7. 0.00001 8. 1,000,000

9. 0.0000001 10. 10,000

11. 0.001 12. 100,000

13. − 14. 

15.  16. 

17.  18. 

19.  20. −

21.  22. 

23.  24. 

25.  26. 

**Exponents and Roots**

**Puzzles, Twisters & Teasers: An Alarming Activity!**

**Decide whether or not each equation is correct. Circle the letters above your answers. Then solve the riddle.**

|  |  |  |  |
| --- | --- | --- | --- |
| 1. | (−2)−4 = 0.0002 | **O** correct | **A** incorrect |
| 2. | 10−5 = 0.00001 | **L** correct | **Z** incorrect |
| 3. | 10−2 = 1.0 | **F** correct | **A** incorrect |
| 4. | 2−3 = 0.3 | **D** correct | **R** incorrect |
| 5. | 10−3 = 0.001 | **M** correct | **S** incorrect |
| 6. | (−4)−3 = 4.004 | **Q** correct | **C** incorrect |
| 7. | 10−4 = 0.0001 | **L** correct | **W** incorrect |
| 8. | 102 = 100 | **U** correct | **E** incorrect |
| 9. | 3−2 = 30.0 | **T** correct | **C** incorrect |
| 10. | 100 = 1 | **K** correct | **P** incorrect |

**What do you call a rooster that wakes you up   
crowing?**

An \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

1 2 3 4 5

\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

6 7 8 9 10

**Puzzles, Twisters & Teasers**

1. A2. L

3. A 4. R

5. M6. C

7. L 8. U

9. C 10. K

A L A R M

C L U C K

**Exponents and Roots**

**Review for Mastery: Integer Exponents**

To rewrite a negative exponent,   
move the power to the denominator   
of a unit fraction.

5−2  

**Complete to rewrite each power with a positive exponent.**

1. 7−3   2. 9−5   3. 13−4  

**Complete each pattern.**

4. 10−1    0.1 5. 5−1  

10−2      0.01 5−2      

10−3  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 5−3  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. 3−1   7. (−4)−1  \_\_\_\_\_\_

3−2       (−4)−2  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3−3  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (−4)−3  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Simplify.**

8. 2−3    \_\_\_\_\_\_\_\_\_\_\_\_ 9. (−6)−2    \_\_\_\_\_\_\_\_\_\_\_\_

10. 4−2    \_\_\_\_\_\_\_\_\_\_\_\_ 11. (−3)−3    \_\_\_\_\_\_\_\_\_\_\_\_

12. 6−2  \_\_\_\_\_\_\_\_\_\_\_\_ 13. (−2)−3  \_\_\_\_\_\_\_\_\_\_\_\_

14. 6−3  \_\_\_\_\_\_\_\_\_\_\_\_ 15. (−5)−2  \_\_\_\_\_\_\_\_\_\_\_\_

16. 2−4  \_\_\_\_\_\_\_\_\_\_\_\_ 17. (−9)−1  \_\_\_\_\_\_\_\_\_\_\_\_

**Exponents and Roots**

**Review for Mastery**

1. 73 2. 95

3. 134

4. = = 0.001

5. = = 

6. = = 

7. ;  
 =  = ;  
 =  = −

8. 23;  9. (−6)2; 

10. 42;  11. (−3)3; −

12.  13. −

14.  15. 

16.  17. −

**Exponents and Roots**

**Problem Solving: Integer Exponents**

**Write the correct answer.**

1. The weight of 107 dust particles is   
1 gram. Simplify 107.

3. As of 2001, only 106 rural homes in the United States had broadband Internet access. Simplify 106.

2. The weight of one dust particle is   
10−7 gram. Simplify 10−7.

4. Atomic clocks measure time in microseconds. A microsecond is   
10−6 second. Simplify 10−6.

**Choose the letter for the best answer.**

5. The diameter of the nucleus of an atom is about 10−15 meter. Simplify 10−15.

A 0.0000000000001

B 0.00000000000001

C 0.0000000000000001

D 0.000000000000001

7. A ruby-throated hummingbird weighs about 3−2 ounce. Simplify 3−2.

A −9

B −6

C 

D 

6. The diameter of the nucleus of an atom is 0.000001 nanometer. How many nanometers is the diameter of the nucleus of an atom?

F (−10)5

G (−10)6

H 10−6

J 10−5

8. A ruby-throated hummingbird breathes 2 × 53 times per minute   
while at rest. Simplify this amount.

F 1,000

G 250

H 125

J 30

**Problem Solving Answers**

1. 10,000,0002. 0.0000001

3. 1,000,000 4. 0.000001

5. D 6. H

7. C 8. G